

What is claimed is:

1. An optoelectronic device comprising:  
an active region;  
a semiconductor region;  
a tunnel junction between the active region and the semiconductor region; and  
a current blocking region between the active region and the semiconductor region,  
wherein the current blocking region operates as a reversed biased PN junction and confines a current between the active region and the semiconductor region to the current through the tunnel junction.
2. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction in which tunneling has been disabled.
3. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction that contains an additional implant that disables tunneling.
4. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction that contains additional dopants that disable tunneling.
5. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction that has a disrupted crystal structure.
6. The device of claim 1, wherein:  
the tunnel junction comprises a heavily doped p-type region and a heavily doped n-type region between the active region and the semiconductor region; and  
the current blocking region comprises a structure that is the same as that of the tunnel junction, except that at least one of the heavily doped p-type region and the heavily doped n-type region is missing from the current blocking region.
7. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction that has been partially diffused

8. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction that has been partially diffused by impurity-induced disordering

9. The device of claim 1, wherein the current blocking region comprises a portion of the tunnel junction that has been partially diffused by impurity-free disordering

10. The device of claim 1, wherein the optoelectronic device is a vertical cavity surface emitting laser.

11. A method for fabricating an optoelectronic device, comprising:  
forming an active region and a semiconductor region with a tunnel junction between the active region and the semiconductor region; and  
disabling tunneling in a selected part of the tunnel junction to form a current blocking region, wherein during operation of the optoelectronic device the tunnel junction conducts a current between the active region and the semiconductor region and the current blocking region acts as a reverse biased PN junction to block current.

12. The method of claim 11, wherein disabling tunneling comprises ion implantation into the selected part of the tunnel junction.

13. The method of claim 12, wherein the implanted species comprise n-type dopants.

14. The method of claim 12, wherein the implanted species comprise p-type dopants.

15. The method of claim 12, wherein the implanted species comprise an ion that reduces the conductivity of the material into which it is implanted

16. The method of claim 11, wherein disabling tunneling comprises disrupting the crystal structure in the selected part of the tunnel junction.

17. The method of claim 11, wherein disabling the tunneling comprises partially diffusing the tunnel junction via impurity-induced disordering

18. The method of claim 11, wherein disabling the tunneling comprises partially diffusing the tunnel junction via impurity-free disordering.

19. The method of claim 11, wherein the optoelectronic device is a vertical cavity surface emitting laser.

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